

CLAIMS

1. A flame resistant fabric, comprising:
a plurality of flame resistant body yarns that form a body of the fabric; and
a plurality of relatively tough yarns provided in discrete positions within the fabric body, the relatively tough yarns comprising a filament yarn that includes a filament composed of one of polyolefin, flame resistant polyester, polytetrafluoroethylene, polyetheretherketone, polyetherimide, polysulfar, polyimide, polyamide, polyimideamide, polybenzoxazole, polybenzimidazole, carbon, and glass.
2. The fabric of claim 1, wherein the body yarns comprise spun yarns that are composed of at least one of meta-aramid, para-aramid, flame resistant cellulosic material, flame resistant wool, flame resistant polyester, polyvinyl alcohol, polytetrafluoroethylene, polyvinyl chloride, polyetheretherketone, polyetherimide, polysulfar, polychlal, polyimide, polyamide, polyimideamide, polyolefin, polybenzoxazole, polybenzimidazole, carbon, modacrylic, and melamine.
3. The fabric of claim 1, wherein the relatively tough yarns are arranged in a grid pattern within the fabric body.
4. The fabric of claim 3, wherein the grid pattern is formed by single relatively tough yarns.

5. The fabric of claim 3, wherein the grid pattern is formed by groups of two or more relatively tough yarns that are woven along with each other in the fabric body.

6. The fabric of claim 1, wherein the filament yarns include a filament composed of one of polybenzoxazole, carbon, and high density polyethylene.

7. The fabric of claim 1, wherein the filament yarns include one or more polybenzoxazole filaments.

8. The fabric of claim 1, wherein the filament yarns have weights in the range of approximately 50 to 600 denier.

9. The fabric of claim 1, wherein the relatively tough yarns further include a spun yarn composed of at least one of meta-aramid, para-aramid, flame resistant cellulosic material, flame resistant wool, flame resistant polyester, polyvinyl alcohol, polytetrafluoroethylene, polyvinyl chloride, polyetheretherketone, polyetherimide, polysulfar, polychlal, polyimide, polyamide, polyimideamide, polyolefin, polybenzoxazole, polybenzimidazole, carbon, modacrylic, and melamine.

10. The fabric of claim 9, wherein the spun yarns have yarn counts of approximately 8 to 55.

11. The fabric of claim 1, wherein the relatively tough yarns further include a plurality of flame resistant fibers.

12. The fabric of claim 11, wherein the flame resistant fibers are composed of at least one of meta-aramid, para-aramid, flame resistant cellulosic material, flame resistant wool, flame resistant polyester, polyvinyl alcohol, polytetrafluoroethylene, polyvinyl chloride, polyetheretherketone, polyetherimide, polysulfar, polychlal, polyimide, polyamide, polyimideamide, polyolefin, polybenzoxazole, polybenzimidazole, carbon, modacrylic, and melamine.

13. A protective garment, comprising:
a flame resistant fabric including:
a plurality of flame resistant body yarns that form a body of the fabric,
and
a plurality of relatively tough yarns provided in discrete positions within the fabric body, the relatively tough yarns comprising a filament yarn that includes a filament composed of one of polyolefin, flame resistant polyester, polytetrafluoroethylene, polyetheretherketone, polyetherimide, polysulfar, polyimide, polyamide, polyimideamide, polybenzoxazole, polybenzimidazole, carbon, and glass.

14. The garment of claim 13, wherein the body yarns comprise spun yarns that are composed of at least one of meta-aramid, para-aramid, flame resistant cellulosic material, flame resistant wool, flame resistant polyester, polyvinyl alcohol, polytetrafluoroethylene, polyvinyl chloride, polyetheretherketone, polyetherimide, polysulfar, polychlal, polyimide, polyamide, polyimideamide, polyolefin, polybenzoxazole, polybenzimidazole, carbon, modacrylic, and melamine.

15. The fabric of claim 13, wherein the relatively tough yarns are arranged in a grid pattern within the fabric body.

16. The garment of claim 15, wherein the grid pattern is formed by single relatively tough yarns.

17. The garment of claim 15, wherein the grid pattern is formed by groups of two or more relatively tough yarns that are woven along with each other in the fabric body.

18. The garment of claim 13, wherein the filament yarns include a filament composed of one of polybenzoxazole, carbon, and high density polyethylene.

19. The garment of claim 13, wherein the filament yarns include one or more polybenzoxazole filaments.

20. The garment of claim 13, wherein the filament yarns have weights in the range of approximately 50 to 600 denier.

21. The fabric of claim 13, wherein the relatively tough yarns further include a spun yarn composed of at least one of meta-aramid, para-aramid, flame resistant cellulosic material, flame resistant wool, flame resistant polyester, polyvinyl alcohol, polytetrafluoroethylene, polyvinyl chloride, polyetheretherketone, polyetherimide, polysulfar, polychlal, polyimide, polyamide, polyimideamide, polyolefin, polybenzoxazole, polybenzimidazole, carbon, modacrylic, and melamine.

22. The fabric of claim 21, wherein the spun yarns have yarn counts of approximately 8 to 55.

23. The fabric of claim 13, wherein the relatively tough yarns further include a plurality of flame resistant fibers.

24. The fabric of claim 23, wherein the flame resistant fibers are composed of at least one of meta-aramid, para-aramid, flame resistant cellulosic material, flame resistant wool, flame resistant polyester, polyvinyl alcohol, polytetrafluoroethylene, polyvinyl chloride, polyetheretherketone, polyetherimide, polysulfar, polychlal, polyimide, polyamide, polyimideamide, polyolefin, polybenzoxazole, polybenzimidazole, carbon, modacrylic, and melamine.

25. A method for forming a flame resistant fabric, comprising:

arranging a plurality of flame resistant spun yarns to form a body of the fabric;

and

forming a grid of relatively tough yarns in the fabric body, each relatively tough yarn comprising a filament yarn including a filament composed of one of polyolefin, flame resistant polyester, polytetrafluoroethylene, polyetheretherketone, polyetherimide, polysulfar, polyimide, polyamide, polyimideamide, polybenzoxazole, polybenzimidazole, carbon, and glass.

26. The method of claim 25, wherein the filament yarns include a filament that is composed of polybenzoxazole.